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Annual crops for forage in the Alberta parklands

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SUMMARY

The annuals for forage program was begun in 1979 and completed in 1983. Work in the southern part of Alberta, covering the Brown and Dark Brown soil zones, both irrigated and dryland, was carried out from the Alberta Horticulture Research Centre at Brooks. The Black and Gray Wooded soil zones were covered from the Agriculture Canada Research Station, Lacombe, by the use of six off-station locations. The productivity of various crops and cultivars was evaluated at several locations, and the following conclusions were drawn.

- Oat was the highest yielding silage crop. Foothill was the best cultivar, particularly on Gray Wooded soils, followed by Fraser, Laurent, Sentinel, and Grizzly.

- Sunflower was the second highest yielding crop, but it cannot be recommended because of extreme variability in yield between locations and years, as well as difficulties in harvesting with cereal or haying equipment.

- Triticale produced good yields, particularly Triwell and several breeders' lines, whereas Rosner and Welsh were somewhat lower yielding.

- Wheat cultivars yielded less than triticale; Wakooma, Pitic, and Glenlea were the better yielding cultivars.

- Barley was of higher quality than the other cereals, containing more protein and less fiber. Johnston was the highest yielding barley cultivar.

- Spring rye was lower yielding than barley; Petkus II, a line from Swift Current Research Station, outyielded other rye cultivars.

- Corn was low yielding because of insufficient heat units.

- Faba bean and pea had the highest percentage of protein and should be used to increase the protein content of silage crops. Faba bean was better on Black soils and had the advantage of an upright growth habit, but pea was higher yielding on Gray Wooded soils.

- A multiple-cut system was used to estimate pasture yield, by cutting each time the regrowth reached 25-30 cm in height. Oat was the highest yielding crop as pasture on Gray Wooded soils; however on Black soils, spring-planted Italian ryegrass, winter wheat, and fall rye were more productive than oat. Spring cereals produced good yields early in the season, with growth declining in the fall, whereas spring-planted winter crops and ryegrass started slowly and produced high yields later in the season.

- Forage rape, fodder radish, and kale produced high yields if not grazed until late fall.

RÉSUMÉ

Le programme sur les annuelles fourragères a commencé en 1979 et a pris fin en 1983. Les travaux dans le sud de l'Alberta sur les zones de sols bruns et brun foncé, irrigués et non irrigués, ont été effectués à partir du Centre de recherches horticoles de l'Alberta, à Brooks. Les zones de sols noirs et forestiers gris ont été étudiées à partir de la Station fédérale de recherches agricoles de Lacombe par le choix de six emplacements hors station. Les chercheurs ont évalué la productivité de divers cultivars et cultures à plusieurs emplacements et ont tiré les conclusions suivantes:

. L'avoine est la plante à ensilage la plus productive. Foothill est le meilleur cultivar, en particulier sur sols forestiers gris, suivi par Fraser, Laurent, Sentinel et Grizzly.

. Le tournesol vient après l'avoine pour la productivité, mais ne peut être recommandé à cause d'une extrême variabilité de rendement d'un endroit et d'une année à l'autre, et des difficultés de récolte à la moissonneuse ou à la ramasseuse-presse.

. Le triticale donne de bons rendements, en particulier Triwell et plusieurs lignées d'obtenteur, alors que Rosner et Welsh s'avèrent moins productifs.

. Les cultivars de blé affichent un rendement moindre que le triticale; Wakooma, Pitic et Glenlea s'avèrent les meilleurs.

. L'orge est de meilleure qualité que les autres céréales, avec une teneur plus élevée en protéines, mais plus faible en cellulose. Johnston est le cultivar le plus productif.

. Le seigle de printemps est moins productif que l'orge; Petkus II, lignée de la Station de recherches de Swift Current, surpasse les autres cultivars de seigle.

. Le maïs est de rendement modeste à cause de l'insuffisance d'unités thermiques.

. La féverole et le pois affichent la plus forte teneur en protéines et devraient servir à relever la concentration protéique des cultures à ensilage. Le féverole donne de meilleurs résultats sur sols noirs et a l'avantage d'avoir un port dressé, mais le pois est plus productif sur sols forestiers gris.

. Un régime multicoupe a servi à évaluer le rendement des pâturages en coupant la repousse dès qu'elle atteint 25 à 30 cm de hauteur. L'avoine est la plante à pâturage la plus productive sur sols forestiers gris, mais sur sols noirs, le ray-grass d'Italie semé au printemps, le blé d'hiver et le seigle d'automne surpassent l'avoine. Les céréales de printemps donnent de bons rendements tôt dans la saison, mais elles régressent à l'automne, alors que les cultures d'hiver et le ray-grass semé au printemps démarrent lentement, mais donnent des rendements élevés plus tard en saison.

. Le colza, le radis et le chou fourragers donnent de bons rendements s'ils ne sont pas pâturés avant la fin de l'automne.

INTRODUCTION

There has not been a critical evaluation of the role of annual crops for forage in Alberta in spite of its position as the major beef-producing province in Canada. Researchers working with forage are primarily interested in perennial grasses and legumes. Interest in annual crops has been oriented primarily toward grain production. This emphasis has resulted in a lack of information on annual forage production, particularly beyond the area in southern Alberta, where corn is recommended. The increased intensity of cropping, brought on by higher land values, has prompted some producers, particularly dairy operators, to grow annuals. Beef producers must also compete with producers in areas with a mild climate, which allows year-round use of rangeland as pasture. Annual crop residues, both in-field and stored, have been and will probably continue to be a source of low-quality feed. Annual crops for forage offer several advantages of perennials, such as higher production, lower harvest and storage losses when ensiled, and a choice of forage or grain production. However, there are several disadvantages, including the following: a requirement for better storage facilities, higher labor requirements for tillage and harvest, and transportation difficulties, which limit silage to on-farm use.

The annuals for forage program was designed to cover the Black and Gray Wooded soil-climatic zones. A primary aim was to establish the potential of various species for forage production and to evaluate cultivars from diverse sources.

All annuals were seeded in small plots (1.2 x 6.0 m) and harvested to determine fresh weight; a subsample was oven-dried to determine dry weight yield as kilograms per hectare. The dried samples were used to determine protein content and acid detergent fiber, from which digestible energy content was estimated.

From 1979 to 1983 this work was supported by a grant from the Farming for the Future program.

Yields of annual crops as silage

Several tests were begun in 1979 to evaluate the production of forage by annual crops. Single entries of 13 crops were tested for silage production at Lacombe and Bluffton in 1979 and 1980 (Table 1). Results indicated that sorghum and soybeans not be tested further because of low yields, that forage rape be tested separately, and that corn be added to the standard test.

The standard test crops for silage production were grown at six or seven locations in central Alberta for 5 years and included several cultivars of five cereals as well as corn, faba bean, pea, and sunflower. Table 2 shows the silage yields in kilograms of dry matter per hectare from all locations for each year. The variation from year to year can be seen, as well as deletions and additions of cultivars. The average species yield, which is calculated from all the cultivar-year yields, gives a good estimate of yields in central Alberta.

The yields of crops in the standard tests over 5 years showed strong similarities based on soil type. The yields from the Black soil locations (Lacombe, Westlock, and Olds-Didsbury) were combined, as were those from the Gray Wooded soil locations (Bluffton, Smoky Lake, and Chedderville-Leslieville). The only Solonetzic soil location was Vegreville. Table 3

shows these yields as a percentage of Foothill oats for each soil type in addition to the actual yields from the three soil types. These data demonstrate the need for recommendations based on soil-climatic zones.

LOCATIONS

The yields of the standard tests at various locations are shown in Tables 4-10. Averages are not listed for crops grown for only 1 year. The 1979 growing season was dry at all locations, which resulted in low yields (Table 2). Fertilizer was applied at all sites in 1979. Nitrogen was applied at 50 kg/ha on Black soil sites and at 75 kg/ha on Gray Wooded soil sites as ammonium nitrate (34-0-0); 25 kg/ha of P_2O_5 (11-55-0) were also applied at all sites.

The 1980 season was dry at seeding, but adequate rainfall throughout the rest of the growing season resulted in good yields at most locations. Fertilizer applications to the standard tests in 1980 were the same as in 1979, except at Olds, where the cooperator applied anhydrous ammonia as the sole source of nitrogen. Beginning in 1981 soils from all sites were analyzed for plant nutrient content, and fertilizer was then added based on recommendations from the Alberta soil-testing laboratory.

Lacombe

All the test crops were grown at the Agriculture Canada Research Station, which was used as the primary test area. This site, with its fertile black neutral soil was considered to be representative of the Black soil zone. A dry year in 1979 and a severe hailstorm on 2 August 1980 were major yield-reducing factors. The forage yields are shown in Table 4.

Westlock

The Westlock site was about 13 km northwest of Westlock, on a Black soil that was slightly acidic, at pH 6.2. The yields here were somewhat lower than those from Lacombe as shown in Table 5. In 1983 more than the recommended amount of fertilizer was applied in error.

Olds-Didsbury

The Olds site was on Black soil, about 24 km west of Olds, and was used as a test location in 1979 and 1980. In 1980 the cooperator applied ammonia, and no additional nitrogen was added. From 1981 to 1983 the plots were grown on a similar Black soil with a pH of 6.0, located about 32 km west of Didsbury (Table 6). In 1983 a light frost on 20 July slightly injured the leaves of the corn but did not appear to reduce yields.

Bluffton

This site, about 10 km north of Bluffton, was considered to be representative of the Gray Wooded soil zone (Table 7). The soil was slightly acidic, with a pH about 6.0, and was low in both potassium and sulfur. Because of its proximity to Lacombe, this site was used for most variety trials on Gray Wooded soils.

Chedderville-Leslieville

Chedderville, a Gray Wooded soil site about 19 km south of Rocky Mountain House, was used as a test site in 1979, 1980, and 1981. This soil was distinctly acidic, with a pH of 5.3. The plots in 1981 were grown on an area summerfallowed in 1980, which resulted in unusually high yields, as shown in Table 8. In 1982 and 1983 the plots were grown at Leslieville, which is about 19 km east of Rocky Mountain House, on a soil type that was similar but less acidic, with pH at about 6.5. In 1982 hail damaged the plots in mid August, severely reducing potential yields.

Smoky Lake

This site was about 10 km east of Smoky Lake on Gray Wooded soil with a pH of 7.5. In 1983 the plots were moved north to a similar soil type with a pH of 6.5, but a dry spring reduced yields, as shown in Table 9.

Vegreville

The Agriculture Canada substation at Vegreville was used for plots from 1981 to 1983. This site was selected as representative of Solonetzic soils. This soil is high in sodium, particularly below the top 15 cm. Total soluble salt and sulfate concentrations increase with soil depth to greater than 1000 ppm, or 7.4 mmho conductivity at the 30-60 cm depth. These salt concentrations can reduce crop growth, as shown in Table 10.

QUALITY

Analysis of annual forages for protein showed considerable year-to-year variation as well as differences between sites (Table 11). As expected, faba bean and pea contained the highest percentage of protein. Of the cereals, barley was the highest, followed by wheat, triticale, oat, and rye, respectively. Sunflower averaged slightly higher than barley, and corn was slightly higher than oat. Percentage of protein was combined with dry-matter yield to estimate actual yield of protein for each crop averaged over 4 years (Table 12). Faba bean and pea produced the most protein, followed by sunflower and oat.

Analysis for fiber allowed digestible energy to be estimated. Dry-matter yields combined with digestible energy per kilogram of dry matter gave an estimate of yields of digestible energy per hectare for each species (Table 13). Averaged over 4 years, oat produced the highest quantity of digestible energy followed by sunflower, triticale, wheat, and barley. Faba bean and pea had the lowest yields of digestible energy.

PASTURE

Multiple cuts to simulate grazing were made on plots at Lacombe and Bluffton from 1979 to 1983. The crops were cut back to 5 cm each time they reached a height of 25-30 cm. At Lacombe, Italian ryegrass consistently gave the highest pasture yields except in the dry season of 1979. Winter cereals produced good pasture yields at Lacombe, whereas oat was consistently the best pasture at Bluffton (Table 14). Triwell replaced Welsh triticale in 1982 because of its higher yield in variety tests, and Halton winter barley was added in 1982. At Lacombe, Halton produced 80% more pasture than Bonanza in the 2 years they were tested together, whereas at Bluffton, their yields were

similar. The crops could easily be divided into early and late season producers. Spring cereals showed more rapid growth in the spring and were ready for pasturing earlier. Italian ryegrass and winter-type cereals grew most rapidly in midsummer and continued to produce well into the fall when moisture was adequate.

CULTIVAR TRIALS

Oat

Oat cultivar trials were carried out at Lacombe from 1979 to 1983 and included Foothill, licensed in 1978 as a forage oat, for comparing yields. Silage yields of common cultivars are shown in Table 15. Less known, foreign and breeders' lines of oat are shown in Table 16. The 1980 cultivar trials at Lacombe were damaged by hail, which reduced yields.

At Bluffton, yields were somewhat lower than at Lacombe. Cultivars and lines are shown in Table 17 for 1981-1983.

Currently recommended cultivars for silage in the parklands, in descending order of yield, are as follows: Foothill, Laurent, Frazer, Grizzly, Harmon, and Cascade.

Barley

Barley is the most commonly used silage crop in the parkland region. This is a result of several factors, including familiarity to producers, choice of seed or silage crop, and availability of seed. Earliness does not interfere with other operations and produces feed that has a higher protein content than do other cereal crops (Table 11). For comparison, Bonanza was selected as a check. Table 18 shows the yields of variety trials carried out at Lacombe. When first tested in 1980, Johnston did not produce the highest yield, but it did rise to first place at both Lacombe and Bluffton for the following 3 years. Yields of barley at Bluffton, as shown in Table 19, are considerably below those at Lacombe. The currently recommended barley cultivars for silage are Johnston, Empress, and Klages in central and northern Alberta; and Johnston, Galt, Klondike, Elrose, and Hector in south and east-central Alberta.

Wheat, rye, and triticale

Wheat, rye, and triticale cultivars were compared in a single test each year from 1980 to 1982 at Lacombe (Table 20) and in 1981 and 1982 at Bluffton (Table 21). In 1983 triticale was tested separately from wheat at both locations.

Cultivars of spring rye were limited to Prolific and Gazelle, with Gazelle producing higher silage yields. Three lines selected from Petkus at Swift Current were tested in 1980 (Table 20). One line, Petkus II, was the highest yielding and with Gazelle was added to the standard test. The testing of wheat, rye, and triticale cultivars took place in 1981 and 1982 at Lacombe and Bluffton (Tables 20 and 21). Rye produced yields similar to wheat and somewhat lower than triticale.

The wheat cultivars Glenlea and Pitic were used in the standard test as checks. When compared with other utility wheats and with hard red spring and durum wheats, they showed similar yields at Lacombe in 1980. It is common practice to salvage grain crops of wheat or rye damaged by drought, hail, or frost for forage, although these crops are not purposely seeded for that use.

The triticale cultivars Rosner and Welsh were used in the standard test beginning in 1979, until the better yielding Triwell was added in 1981. In 1981 and 1982 Triwell was the highest producing cultivar at Bluffton (Table 21) and in 1982 at Lacombe (Table 20). The cultivars Triwell and Carman are recommended for silage production in the parkland region.

Sunflower

Sundak sunflower in the standard test produced highly variable forage yields in various years and locations (Tables 2-10). A similar variability was found in the cultivar test at Lacombe over the years 1979-1983 (Table 22). Kenya White, introduced and supplied by Morden Research Station, produced the highest total yield . The cultivar is very tall (3 m) and difficult to harvest, as would be most other cultivars whose stem base has a diameter of up to 60 mm. The low yields in 1980 were partly due to hail damage. Although sunflowers have a potential for high silage yield, year-to-year variability and potential harvest problems restrict their use as a silage crop.

Faba bean

Faba bean cultivars and lines were evaluated at Lacombe from 1980 to 1983 (Table 23). The cultivars Herz Freya, Aladin, and Outlook were good forage producers, Diana was somewhat lower, and Ackerperle was the lowest producer. Orion and Lacombe No. 3 were selected for seed yield and earliness, and do not yield as well for forage. The faba bean test was grown at Bluffton in 1981, 1982, and 1983 as well as at Vegreville in 1982 and 1983; yields are shown in Table 24. Faba bean outyielded peas on Black soils, but on Gray Wooded and Solonetzic soils, pea usually produced more than did faba bean. Faba bean has the advantage of an upright growth habit and a slightly higher protein content, 17-20%, when compared with peas at 16-17%.

Pea

Pea cultivars were evaluated for silage yield for the years 1980-1983 (Table 25). Generally, the cultivars Tara, Century, and Lenca yielded better than did Trapper and Triumph. Pea should be used as a source of high protein in mixtures or should be combined with low-protein silage crops in the Gray Wooded soil areas, where it produces very well.

Corn

Cultivars of corn were evaluated at Lacombe over 3 years for silage yield (Table 26). In 1981 the yields were very good, and in 1983 they were very low. This variation was also found with corn in the standard test between years and locations. In 1982 North American and European hybrids were compared, but neither group had a yield advantage. Corn cannot be recommended in short-season areas because of its variable yields and the requirement for specialized harvesting equipment.

Proso and Foxtail millet

Ten lines of Proso millet and eight lines of Foxtail millet from Morden, Man., were evaluated for silage yield at Lacombe in 1981 and 1982 (Table 27). Good silage yields were found in 1981 for some of the lines, but they did not

mature to produce seed. The earliest line, NC22-3, does occasionally produce mature seed, but both types are extremely frost sensitive and are not adapted to the parkland area's short season.

Italian ryegrass

Four cultivars of Italian ryegrass were evaluated at Lacombe for their silage (two cuts), hay (three cuts), and pasture (four or five cuts) production from 1981 to 1983 (Table 28). They mature earlier than cereals, and when cut as silage at the soft-dough stage, sufficient regrowth occurred to warrant a second cut. The hay cuts were made shortly after heading and resulted in three cuts. As simulated pasture, the plots were cut each time the growth reached 30 cm, which resulted in four or five cuts. The highest yields were found as silage, with the exception of Lemtal in 1981 and Lemtal, Maris Ledger, and Merwester in 1982. In general, Promenade was the best silage cultivar, Merwester the best for hay, and Maris Ledger the best for pasture. All cultivars under the three types of harvest produced lower yields in 1983 because of a dry spring and fall. Ryegrasses are perennials in areas with mild climates, but in Alberta they must be considered annuals, as they do not survive the winter.

Winter cereal pastures

The pasture yields of spring-planted cultivars of winter wheat, triticale, and fall rye were evaluated at Lacombe in 1983 (Table 29). The total pasture yield of Norstar winter wheat was the lowest, an unexpected occurrence because it has regularly outyielded fall rye in pasture production in previous years. Sundance, followed by Kodiak, produced the highest first-cut yields, whereas Winalta produced more in the second and third cuts. Norstar produced the second lowest yield in the first cut and the lowest yield in the third cut. The spring and fall of 1983 were very dry, and Norstar may require better conditions to reach its potential productivity.

Brassica species

Several species of brassica crops were compared with canola for forage yield under a two-cut system (pasture) and a single-cut system (silage) late in the season, on 1 October (Table 30). Several crops produced good yields under the single-cut system, but none produced satisfactory regrowth when cut on 29 July. Appin grazing turnip produces fleshy roots, and cut 2 includes root weight. Very high yields were recorded for most of these cultivars in 1983 (Table 31). Altex, Tobin, Apoll, and Neris changed from vegetative growth to flowering and were cut on 29 July in the silage test. The others did not flower and continued to grow until cut on 14 September, at which time any regrowth from those cut 29 July was also harvested.

For pasture the first cut was taken on 4 July. Two more cuts were taken from the cultivars that showed sufficient regrowth, one on 26 July and the last on 16 September. The remaining cultivars regrew very slowly after the first cut, and a second cut was not taken until 16 September.

The brassica crops were regularly damaged in the spring by flea beetles, and occasionally this attack was severe enough to require the use of insecticide sprays. Cabbageworms were found on brassica in the fall but not in sufficient numbers to warrant control measures.

Frost-tolerant brassica crops are useful only as late fall pasture since they continue to produce very late in the fall if they are not harvested earlier. Their use as silage is not practical because of the late harvest of material with very high moisture content.

Table 1. Silage yield of species at Lacombe and Bluffton for 1979 and 1980, in kilograms per hectare of dry matter

	Lacombe		Bluffton	
	1979	1980	1979	1980
Foothill oat	11 962	10 329	4 955	10 118
Bonanza barley	7 657	10 061	3 111	3 543
Welsh triticale	10 123	13 383	3 456	6 309
Glenlea wheat	10 128	12 041	2 511	7 209
Diana faba bean	5 956	6 995	1 602	4 873
Tara pea	6 933	5 463	2 269	1 705
G4077 corn	5 770	9 896	1 029	4 274
Pioneer 931 sorghum	5 004	6 172	249	167
Sundak sunflower	11 299	5 468	2 275	4 121
Maple Arrow soybean	2 602	1 232	521	91
NC22-3 Proso millet	6 433	6 203	494	317
Gazelle spring rye	3 059	12 336	703	6 480
Dwarf Essex rape		16 971		11 402

Table 2. Silage yield of annual forage crops in Central Alberta, in kilograms per hectare, at six locations in 1979 and 1980 and seven locations in 1981-1983

Crop	1979	1980	1981	1982	1983	Yearly average	Average species yield
Barley							
Betzes	5164	6537				5851	
Klondike	5371	6240	6108			5906	
Bonanza	5226	6928	6688	5250	6176	6054	(barley
Fairfield	5446	6775	6511	5640	6050	6085	6184)
Johnston				6871	6646	6758	
Halton					6448	6448	
Wheat							
Glenlea	6041	7335	6845	5457	6313	6398	
Pitic	5960	7676	7073	5759	5988	6491	(wheat
Neepawa				5703		5703	6197)
Rye							
Petkus II			7149	6011	7226	6795	
Gazelle	4793	7245				6019	(rye
Prolific	3217	6667				4942	5919)
Triticale							
Triwell			7821	6922	7062	7268	
598				6589		6589	(triticale
Rosner	5234	7004	6995	6167		6350	6615)
Welsh	5462	6995	6305			6254	
Oat							
Foothill	7978	9715	7996	7899	8234	8364	
Fraser	7502	9618	7627	7625	8478	8170	
Grizzly	7367	8926	7384	7669	7890	7847	
Harmon			7710	7588		7649	(oat
Laurent			8553	7729	7893	8058	8098)
Cascade				7519		7519	
Sentinel					8791	8791	
OA330-60					8383	8383	
Other							
Corn			5875	5076	5659	5537	5537
Faba bean	3865	4413	5283	5613	5709	4977	4977
Pea	4333	4393	5184	5930	5812	5130	5130
Sunflower	6147	3547	9837	7120	9570	7244	7244

Table 3. Silage yield of annual forage crops and as a percentage of Foothill oat on three soil types

Crop	Black soils 15 stn.-years (kg/ha)	(%)	Grey Wooded soils 15 stn.-years (kg/ha)	(%)	Solonetzic soil 3 stn.-years (kg/ha)	(%)
Barley						
Betzes	6 994	72	4 707	63		
Klondike	7 455	77	4 662	62	3 406	58
Bonanza	7 696	80	4 960	66	4 485	77
Fairfield	7 472	77	5 241	70	5 073	87
Johnston	8 628	89	5 554	74	5 851	100
Halton	7 995	83	5 410	72	5 019	86
Wheat						
Glenlea	8 068	83	5 132	69	4 622	79
Pitic	7 835	81	5 400	72	5 306	91
Neepawa	6 844	71	4 199	56	6 586	113
Rye						
Petkus II	8 321	86	5 608	75	5 607	96
Gazelle	7 345	76	4 693	63		
Prolific	5 849	60	4 034	54		
Triticale						
Triwell	9 169	95	6 170	83	5 054	86
598	8 118	84	4 423	59	9 347	160
Rosner	7 653	79	5 179	69	5 481	94
Welsh	7 500	78	5 383	72	2 983	51
Oat						
Foothill	9 669	100	7 466	100	5 842	100
Fraser	9 835	102	7 084	95	6 451	110
Grizzly	9 236	96	7 000	94	5 302	91
Harmon	9 123	94	6 819	91	5 893	101
Laurent	9 681	100	7 098	95	6 131	105
Cascade	9 814	101	5 730	77	6 476	111
Sentinel	11 279	117	7 701	103	6 834	117
OA330-60	11 806	122	7 560	101	4 668	80
Other						
Corn	8 032	83	5 013	67	3 658	63
Faba bean	6 187	64	4 399	59	2 992	51
Pea	5 494	57	4 904	66	4 630	79
Sunflower	8 819	91	6 444	86	8 111	139

Table 4. Silage yields of annual forage crops at Lacombe, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	6 480	8 426				7 453
Klondike	8 236	10 420	10 192			9 616
Bonanza	7 603	10 681	10 316	8 900	9 676	9 435
Fairfield	7 376	7 314	9 990	8 213	8 755	8 329
Johnston				11 212	8 120	9 666
Halton					10 856	
Wheat						
Glenlea	9 397	11 537	10 908	8 397	10 739	10 195
Pitic	9 212	11 618	10 629	6 220	8 720	9 279
Neepawa				8 190		
Rye						
Petkus II			12 100	7 529	11 284	10 304
Gazelle	4 995	11 299				8 147
Prolific	1 711	9 904				5 807
Triticale						
Triwell			12 015	10 787	11 032	11 278
598				10 188		
Rosner	7 860	9 868	11 646	9 472		9 711
Welsh	8 180	10 510	9 886			9 525
Oat						
Foothill	9 910	12 183	11 389	11 808	11 532	11 364
Fraser	10 036	11 883	13 013	11 634	12 634	11 840
Grizzly	10 358	9 141	12 413	11 802	10 952	10 933
Harmon			12 112	11 408		11 760
Laurent			14 419	10 430	10 508	11 785
Cascade				11 718		
Sentinel					12 689	
OA330-60					14 909	
Other						
Corn			13 343	8 267	10 226	10 612
Faba bean	5 616	5 520	9 644	9 140	9 220	7 828
Pea	3 937	4 098	6 830	6 992	4 341	5 239
Sunflower	9 270	4 513	13 562	13 223	15 629	11 239

Table 5. Silage yields of annual forage crops at Westlock, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	6 747	5 996				6 371
Klondike	6 597	5 137	5 317			5 683
Bonanza	6 312	5 540	5 903	4 837	6 636	5 845
Fairfield	6 707	5 688	6 233	6 465	6 526	6 323
Johnston				6 253	6 852	6 552
Halton					4 467	
Wheat						
Glenlea	7 496	4 394	4 688	4 394	6 956	5 585
Pitic	7 966	4 935	5 394	5 492	4 722	5 901
Neepawa				4 864		
Rye						
Petkus II			5 185	4 985	5 768	5 312
Gazelle	7 965	5 170				6 567
Prolific	6 349	5 237				5 793
Triticale						
Triwell			6 572	7 460	6 081	6 704
598				7 945		
Rosner	6 898	4 965	4 457	5 770		5 522
Welsh	7 613	4 792	4 221			5 542
Oat						
Foothill	9 773	6 378	6 767	7 971	6 824	7 542
Fraser	9 041	6 657	5 743	7 125	8 002	7 313
Grizzly	8 776	6 413	5 014	7 520	7 132	6 971
Harmon			6 592	6 923		6 757
Laurent			6 654	7 333	6 188	6 725
Cascade				6 788		
Sentinel					9 064	
OA330-60					10 140	
Other						
Corn			5 190	7 755	11 137	8 027
Faba bean	6 553	4 059	3 690	5 764	5 746	5 162
Pea	5 913	4 402	5 784	6 638	5 780	5 703
Sunflower	6 565	3 316	10 249	9 191	11 088	8 081

Table 6. Silage yields of annual forage crops at Olds in 1979-1980 and Didsbury 1981-1983, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	4 802	9 512				7 157
Klondike	5 083	7 803	8 309			7 065
Bonanza	5 016	9 219	9 239	6 070	8 514	7 809
Fairfield	5 691	9 985	8 010	6 644	8 493	7 764
Johnston				8 876	10 457	9 666
Halton					8 663	
Wheat						
Glenlea	6 676	8 370	10 104	6 815	10 157	8 424
Pitic	6 038	8 468	10 047	7 303	9 725	8 316
Neepawa				7 477		
Rye						
Petkus II			10 172	7 434	10 435	9 347
Gazelle	5 549	9 092				7 320
Prolific	3 735	8 158				5 946
Triticale						
Triwell			10 288	7 098	11 188	9 524
598				6 220		
Rosner	5 305	8 803	10 308	6 485		7 725
Welsh	5 636	8 128	8 539			7 434
Oat						
Foothill	8 738	13 457	8 065	8 401	11 845	10 101
Fraser	8 454	12 389	8 468	9 913	11 394	10 123
Grizzly	7 624	11 538	9 247	10 142	10 469	9 804
Harmon			8 629	9 073		8 851
Laurent			10 376	10 614	10 620	10 533
Cascade				10 935		
Sentinel					12 083	
OA330-60					10 369	
Other						
Corn			6 042	3 498	6 828	5 456
Faba bean	3 110	4 320	6 763	6 611	7 054	5 571
Pea	5 185	4 683	4 334	4 388	9 115	5 541
Sunflower	8 551	3 981	10 051	4 783	8 323	7 137

Table 7. Silage yields of annual forage crops at Bluffton, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	3 670	3 741				3 705
Klondike	3 395	3 068	3 433			3 298
Bonanza	3 358	4 393	4 792	4 837	6 636	4 803
Fairfield	3 617	5 169	4 618	6 465	6 526	5 279
Johnston				6 253	6 852	6 552
Halton					4 467	
Wheat						
Glenlea	2 690	6 545	7 124	4 394	6 956	5 541
Pitic	3 500	6 795	5 882	5 492	5 722	5 658
Neepawa				4 864		
Rye						
Petkus II			7 222	4 985	5 768	5 991
Gazelle	1 703	6 301				4 002
Prolific	601	5 719				3 160
Triticale						
Triwell			6 872	7 460	6 081	6 804
598				7 945		
Rosner	2 777	6 941	6 745	5 770		5 558
Welsh	3 113	6 339	6 296			5 249
Oat						
Foothill	5 659	8 020	8 542	7 971	6 824	7 413
Fraser	4 480	8 751	6 507	7 125	8 002	6 973
Grizzly	4 173	9 716	6 915	7 520	7 132	7 091
Harmon			7 715	6 923		7 319
Laurent			7 172	7 333	6 188	6 760
Cascade				6 788		
Sentinel					9 064	
OA330-60					10 140	
Other						
Corn			3 808	7 755	11 137	7 566
Faba bean	1 362	4 549	4 737	5 764	5 746	4 431
Pea	3 334	2 739	4 215	6 638	5 780	4 541
Sunflower	1 915	4 378	7 682	9 191	11 088	6 850

Table 8. Silage yields of annual forage crops at Chedderville in 1979-1981 and Leslieville in 1982-1983, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	3 814	4 702				4 258
Klondike	3 521	4 266	8 251			5 346
Bonanza	3 443	4 516	9 016	2 567	5 930	5 094
Fairfield	3 737	5 373	7 837	2 791	7 219	5 391
Johnston				3 545	8 395	5 970
Halton					8 481	
Wheat						
Glenlea	3 151	6 033	7 469	1 761	4 897	4 662
Pitic	2 965	5 923	8 992	3 059	5 207	5 229
Neepawa				3 047		
Rye						
Petkus II			6 789	3 698	7 268	5 918
Gazelle	2 386	3 881				3 133
Prolific	899	3 431				2 165
Triticale						
Triwell			9 071	3 895	6 564	6 510
598				2 191		
Rosner	1 710	4 732	7 239	2 792		4 118
Welsh	1 407	5 622	6 968			4 665
Oat						
Foothill	5 297	9 132	9 749	5 121	9 990	7 857
Fraser	5 276	8 751	9 652	4 087	9 840	7 521
Grizzly	5 179	8 491	9 009	4 877	9 701	7 451
Harmon			8 499	5 215		6 857
Laurent			9 818	5 477	10 925	8 740
Cascade				5 038		
Sentinel					9 761	
OA330-60					9 054	
Other						
Corn			3 556	3 103	4 800	3 819
Faba bean	2 153	2 817	5 766	3 272	6 190	4 039
Pea	3 217	5 947	5 671	4 571	6 984	5 278
Sunflower	4 266	2 511	8 737	2 567	8 305	5 277

Table 9. Silage yields of annual forage crops at Smoky Lake, in kilograms per hectare

Crop	1979	1980	1981	1982	1983	Average
Barley						
Betzes	5 474	6 845				6 159
Klondike	5 394	6 748	3 884			5 342
Bonanza	5 623	7 221	4 474	3 141	4 456	4 983
Fairfield	5 557	7 118	5 222	3 416	3 951	5 052
Johnston				3 426	4 857	4 141
Halton					3 281	
Wheat						
Glenlea	6 835	7 131	4 968	3 902	3 133	5 193
Pitic	6 078	7 419	5 508	4 366	3 202	5 314
Neepawa				4 685		
Rye						
Petkus II			5 341	4 509	4 752	4 867
Gazelle	6 162	7 727				6 944
Prolific	6 005	7 552				6 778
Triticale						
Triwell			7 376	4 085	4 124	5 195
598				3 132		
Rosner	6 855	6 711	5 493	4 395		5 863
Welsh	6 885	6 577	5 245			6 235
Oat						
Foothill	8 494	9 072	7 863	5 828	4 383	7 128
Fraser	7 799	9 274	6 562	5 696	4 465	6 759
Grizzly	8 092	8 259	5 779	5 284	4 880	6 458
Harmon			7 113	5 449		6 281
Laurent			7 550	5 409	4 421	5 793
Cascade			5 264			
Sentinel					4 278	
OA330-60					3 485	
Other						
Corn			6 423	3 431	1 111	3 655
Faba bean	4 397	5 214	4 448	5 182	4 400	4 728
Pea	4 415	4 492	5 590	7 238	2 731	4 893
Sunflower	6 317	2 583	11 453	8 327	7 340	7 204

Table 10. Silage yield of annual forage crops at Vegreville, in kilograms per hectare

Crop	1981	1982	1983	Average
Barley				
Klondike	3406			
Bonanza	3077	6110	4268	4485
Fairfield	3666	7618	3937	5073
Johnston		7714	3988	5851
Halton			5019	
Wheat				
Glenlea	2654	6786	4428	4622
Pitic	3059	7874	4986	5306
Neepawa	6586			
Rye				
Petkus II	3234	7399	6190	5607
Triticale				
Triwell	2556	7563	5044	5054
598		9347		
Rosner	3079	7883		5481
Welsh	2983			
Oat				
Foothill	3594	8043	5891	5842
Fraser	3443	8275	7637	6451
Grizzly	3314	7432	5161	5302
Harmon	3308	8478		5893
Laurent	3891	7960	6544	6131
Cascade		6476		
Sentinel			6834	
OA330-60			4668	
Other				
Corn	2762	5985	2227	3658
Faba bean	1931	4182	2865	2992
Pea	3867	6384	3639	4630
Sunflower	7129	8901	8305	8111

Table 11. Average percentage of protein of annual forages, 1980-1983

Crop	1980	1981	1982	1983	Average	Average species yield
Oats						
Foothill	6.3	9.1	7.3	7.9	7.6	(oat 8.0)
Fraser	6.9	8.7	7.7	8.0	7.8	
Grizzly	7.1	9.3	7.6	8.3	8.1	
Laurent		8.6	7.6	8.3	8.2	
Harmon		8.5	7.6		8.0	
Cascade			7.5		7.5	
Sentinel				8.6	8.6	
OA330-60				7.9	7.9	
Barley						
Klondike	9.5	10.1			9.8	(barley 9.3)
Bonanza	9.3	9.7	9.9	9.8	9.7	
Betzes	8.7				8.7	
Fairfield	9.0	10.1	9.8	9.8	9.7	
Johnston			8.4	9.5	8.9	
Halton				9.0	9.0	
Wheat						
Glenlea	8.0	9.5	8.8	9.1	8.8	(wheat 8.9)
Pitic	8.3	9.1	8.9	9.2	8.9	
Neepawa			9.1		9.1	
Rye						
Gazelle	7.3				7.3	(rye 7.5)
Prolific	7.5				7.5	
Petkus II		7.7	7.8	7.9	7.8	
Triticale						
Welsh	8.5	9.2			8.8	(triticale
Rosner	7.5	8.7			8.1	8.4)
598		7.8			7.8	
Triwell		9.4	8.1	8.8	8.8	
Other						
Diana faba bean	18.7	18.7	17.9	16.1	17.8	
Tara pea	16.5	17.0	16.6	16.4	16.6	
Sundak sunflower	11.6	9.9	8.9	9.7	10.0	
Corn		9.3	8.0	7.5	8.3	

Table 12. Average protein yield of forage species over 4 years, in kilograms per hectare, at six locations in 1980 and seven locations in 1981-1983

Crop	1980	1981	1982	1983	Average of 27 location-years
Oat	637(3)*	681(5)	595(6)	686(6)	650
Barley	604(4)	617(3)	575(3)	599(4)	599
Wheat	612(2)	621(2)	516(3)	576(2)	581
Triticale	560(2)	628(3)	526(3)	627(1)	585
Rye	514(2)	542(1)	483(1)	590(1)	532
Sunflower	411(1)	948(1)	557(1)	873(1)	697
Faba bean	825(1)	915(1)	1084(1)	927(1)	938
Pea	725(1)	860(1)	945(1)	953(1)	871
Corn	--	480(1)	416(1)	411(1)	436

* Figure in parentheses indicates number of cultivars.

Table 13. Estimated average digestible energy yield of forage species over 4 years, in MCal/ha x 10^{-3}, in six locations in 1980 and seven locations in 1981-1983

Crop	1980	1981	1982	1983	Average of 27 location-years
Oat	24.2(3)*	19.5(5)	19.9(6)	21.9(6)	21.4
Barley	19.0(4)	16.7(3)	17.5(3)	19.2(4)	18.1
Wheat	21.5(2)	17.4(2)	15.6(3)	18.3(2)	18.2
Triticale	18.8(2)	17.3(3)	18.0(3)	21.2(1)	18.8
Rye	16.8(2)	16.5(1)	15.2(1)	19.4(1)	17.0
Sunflowers	9.6(1)	23.3(1)	18.3(1)	26.0(1)	19.3
Faba bean	11.6(1)	12.7(1)	16.4(1)	16.0(1)	14.2
Pea	11.6(1)	13.2(1)	17.0(1)	17.5(1)	14.8
Corn	--	16.5(1)	14.3(1)	17.2(1)	16.0

* Figure in parentheses indicates number of cultivars.

Table 14. Pasture yields at Lacombe and Bluffton, 1979-1983, in kilograms per hectare of dry matter

Crop	1979	1980	1981	1982	1983	Yearly average
			Lacombe			
Foothill oat	3885	3724	3189	2892	3046	3347
Bonanza barley	2884	2464	1921	1830	1852	2190
Welsh triticale	1572	1840	1679			1697
Triwell triticale				1789	2171	1980
Glenlea wheat	2033	2852	1931	1132	2105	2011
Norstar winter wheat	4720	6424	4701	3478	3189	4502
Kodiak fall rye	2532	5430	4242	5018	3786	4202
Gazelle spring rye	947	2941				1944
Proso millet	5533	539				3036
Italian ryegrass	1865	7566	5935	5153	4551	5014
Halton winter barley				3291	3437	3364
			Bluffton			
Foothill oat	1982	2375	2701	1458	2013	2106
Bonanza barley	1128	1353	1508	1130	1706	1365
Welsh triticale	1180	1577	1366			1374
Triwell triticale				1238	1085	1162
Glenlea wheat	1297	2104	1145	839	1049	1278
Norstar winter wheat	1032	495	1616	789	1865	1159
Kodiak fall rye	1371	720	1967	709	1903	1334
Gazelle spring rye	1016	2064				1540
Proso millet	1209					1209
Italian ryegrass	783	1600	1898	1201	1534	1403
Halton winter barley				1099	1721	1410

Table 15. Silage yield of oat cultivars at Lacombe over 5 years, in kilograms per hectare

Cultivar	1979	1980	1981	1982	1983
Laurent	11 117	10 252	12 765	13 641	9 569
Harmon	11 028	8 946	11 473	11 384	9 979
Foothill	10 872	11 039	10 776	11 828	9 475
Hudson	10 710	9 656	11 043	12 893	9 167
Grizzly	10 453	8 891	11 471	12 124	
Victory	10 447	9 706	9 972		
Scott	10 355	9 948	12 226	12 710	9 106
Gemini	10 230	8 991	10 579		
Eagle	10 101	9 052	6 550		
Larain	10 079	7 608	10 855		
Kelsey	9 929	9 517			
Rodney	9 922	7 521			
Fraser	9 807	9 083	12 542	12 627	
Cascade	9 783	8 575	12 645	12 889	8 272
Athabasca	9 656	9 205	10 432		
Garry	9 220		8 552		
Random	9 112	9 979	11 060		
Glen	8 967				
Cavell	8 963				
Terra	8 589				
Hinoat	8 095				
Pendek	7 795				
Sentinel			11 849	13 479	

Table 16. Silage yield of oat cultivars and lines at Lacombe over 5 years, in kilograms per hectare

Cultivar	1979	1980	1981	1982	1983
Foothill	10 872	11 039	10 776	11 828	9 475
OA348-44			7 899		
OA330-60				14 230	
OA330-44					10 320
1863-515					10 659
2088-524					10 882
Dula	10 429	10 153	12 139	12 042	9 783
Bianca	10 258	8 061			
Alma	10 229	11 154	11 828	12 194	9 752
Natal	9 943	9 400			
Vicar	9 803	10 289	10 161		
Elgin	9 656	7 594			
Leanda	9 572	7 917			
Sioux	8 947				
Lamar		9 276	10 176		
Kalott		8 741	10 314		

Table 17. Silage yield of oat cultivars and lines at Bluffton, in kilograms per hectare

Cultivar	1981	1982	1983
Laurent	7487	4999	5750
Harmon	8024	5295	5551
Foothill	8685	6027	4126
Hudson	8165	5183	5343
Grizzly	7116	5123	
Victory	7718		
Dula	7828	5283	3527
Scott	7716	5655	5222
Alma	7776	5248	5804
Fraser	7578	5368	
Vicar	7035		
Random	7429		
OA330-60		6517	
Sentinel		5397	
Cascade		4820	5580
OA330-44			6210
1863-515			5716
2088-524			6048

Table 18. Silage yield of barley cultivars at Lacombe over 5 years, in kilograms per hectare

Cultivar	1979	1980	1981	1982	1983
Johnston		9 971	9 336	9 732	9 794
Empress					9 010
Klages	7 341	9 348	7 408	8 614	9 665
Galt	8 170	7 573	7 177		
Hector	7 986	10 210	6 862	7 334	
Klondike	6 992	8 109			
Bonanza	6 547	10 700	8 343	8 931	8 425
Windsor	7 698	10 217	7 629	9 058	8 538
Betzes	6 967	9 203			
Conquest		9 099			
Centennial	8 467	10 131	8 512	7 415	7 992
Keystone	7 442	10 285	7 894	8 932	9 786
Unitan	7 026	11 511	6 963	8 241	
Fairfield	6 516	10 253	7 034	8 130	
Norbert					9 155
Diamond					7 092
Beacon	6 584	9 097			
Gateway 63	6 996	8 982			
Olli	6 451				

Table 19. Silage yield of barley cultivars at Bluffton over 3 years, in kilograms per hectare

Cultivar	1981	1982	1983
Johnston	5780	4395	5664
Centennial	4616	2249	3557
Windsor	5289	3148	4511
Bonanza	4481	2407	3356
Keystone	4552	3191	4075
Klages	4960	2734	4233
Unitan	4639	2982	
Hector	4714	2703	
Galt	4227		
Fairfield	4271	2957	
Norbert			3682
Diamond			4179
Empress			3633

Table 20. Silage yield of wheat, rye, and triticale cultivars at Lacombe, in kilograms per hectare

Crop	1980	1981	1982	1983
Red spring wheat				
Park	9 105			
Neepawa	10 579	12 502	10 831	9 442
Manitou	9 733			
Sinton	10 122			
Thatcher	10 562	11 032		
Columbus				10 094
Utility wheat				
Glenlea	10 214	11 533	11 246	9 753
Pitic	11 304	11 111	10 680	
Fielder	9 566			
Durum wheat				
Wascana	9 970			
Wakooma	11 326	10 478	11 601	11 521
Coulter	10 168			
Triticale				
Rosner	10 027	11 560	11 512	11 674
Welsh	9 808	10 915	8 850	9 142
Triwell	12 831	11 350	13 468	12 153
Carman				13 925
Spring rye				
Gazelle	10 553	11 017	10 925	
Prolific	9 879			
Petkus I	10 923			
Petkus II	11 491	10 908	11 208	
Petkus III	8 782			

Table 21. Silage yield of wheat, rye, and triticale cultivars at Bluffton over 3 years, in kilograms per hectare

Crop	1981	1982	1983
Wheat			
Neepawa	4914	3045	3444
Glenlea	5124	2778	3171
Pitic	5016	3359	
Thatcher	4582		
Wakooma	4162	3246	2905
Columbus			3677
Spring rye			
Gazelle	4138	2600	
Petkus II	5337	3431	
Triticale			
Triwell	6300	3961	5269
Rosner	4388	3171	5490
Welsh	4712	2251	4318
Carman			5226

Table 22. Silage yield of sunflower cultivars at Lacombe over 5 years, in kilograms per hectare

Cultivar	1979	1980	1981	1982	1983	Average
Sundak	7 713	4 222	8 090	13 477	14 499	9 600
Sputnik	10 940	4 524	10 485	8 822	11 281	9 210
Sungro 372A	11 719	8 958	11 205	11 257	15 231	11 674
Sungro 380		12 944	8 939	9 628	13 011	11 130
Kenya White		5 167	18 393	14 581		12 714
Hybrid 894		5 911	11 891	8 657		8 820
81-1110-2				11 650	16 687	14 168
81-1421				14 081	15 295	14 688
Jerusalem artichoke	5 115	3 585				4 350
894					13 194	13 194
82-245					9 354	9 354
Dahlgren 135					17 892	17 892
Super 500					17 358	17 358

Table 23. Silage yield of faba bean at Lacombe over 4 years, in kilograms per hectare

Cultivar	1980	1981	1982	1983	4-year average
Diana	6 092	11 110	8 029	10 417	8 912
Herz Freya	6 441	14 308	13 054	10 687	11 122
Aladin	7 754	8 581	12 206	11 076	9 904
Outlook		13 053	11 614	11 401	12 023
Ackerperle	4 553				4 553
Orion	5 541	10 724	6 122	8 335	7 680
Lacombe #3	4 481	9 578	6 221	9 061	7 335

Table 24. Silage yield of faba bean at Bluffton and Vegreville in kilograms per hectare

Cultivar	Bluffton			Vegreville	
	1981	1982	1983	1982	1983
Diana	3353	5992	3841	4444	2205
Herz Freya	4147	6321	3573	6055	2314
Aladin	2935	7642	4122	6156	2202
Outlook	2980	7071	3359	5859	2072
Orion	3827	4637	3630	3677	1348
Lacombe 3	3105	4245	3078	4769	1289

Table 25. Silage yield of pea cultivars at Lacombe over 4 years, in kilograms per hectare

Cultivar	1980	1981	1982	1983
Tara	6 955	7 919	10 373	10 612
Trapper	6 610	7 592	11 417	6 653
Century	5 713	8 622		8 566
Lenca		8 362		7 289
Triumph		6 540		5 730

Table 26. Silage yield of corn at Lacombe over 3 years, in kilograms per hectare

Cultivars	1981	1982	1983
Stewart 3502	15 662		
Morden 7G	11 983		
Pride R102	19 786		2 787
G-4077	11 488		
Northrup King PX403	11 583	10 073	3 446
Pioneer 3995		8 556	2 028
AS*		12 670	
DeKalb 182		11 073	
Pickseed 2555		10 997	
Limagrain GLG223*	10 783		
Limagrain GLG152*	10 436		
Pioneer 3994		10 425	3 025
Limagrain 3*		10 146	2 708
EDO*		10 023	
Asgrow RX17		9 843	2 891
Cargill PAG501		9 836	
Pickseed 2111		9 631	
Limagrain 1*		9 503	
Br 180*	9 497		
Pioneer 3993		9 485	
KWS 130*		9 272	
DeKalb 23		9 045	
Pride 1108		8 225	
Hyland 2200			3 272
Pioneer 3996			2 924
Pride R097			2 580
Pickseed 2011			3 435

*European hybrids

Table 27. Silage yield of millets at Lacombe over 2 years, in kilograms per hectare

Cultivar	1981	1982	Average
Proso millet			
NC 22-36	10 753	7 945	9 349
NC 22-50	10 262	7 598	8 930
NC 22-3	9 643	6 068	7 856
NC 22-47	8 929	6 420	7 674
NC 22-44/1	8 831	5 867	7 349
NC 22-14	8 431	6 149	7 290
NC 22-17	8 294	5 551	6 922
NC 22-44	8 260	5 424	6 842
NC 22-43	8 194	5 496	6 845
NC 22-42	6 762	5 734	6 248
Foxtail millet			
NC 21-9	11 386	6 536	8 961
NC 21-10	11 258	6 192	8 725
NC 21-43/1	9 698	7 406	8 552
NC 21-42/1	9 032	6 072	7 552
NC 21-41/1	8 534	6 471	7 502
NC 21-35	8 115	6 183	7 149
NC 21-21	7 831	5 465	6 648
NC 21-20	7 384	5 122	6 253

Table 28. Forage yield of ryegrass cultivars at Lacombe over 3 years, in kilograms per hectare

Cultivar	1981	1982	1983	3-year average
		Silage (two cuts)		
Lemtal	10 141	7 627	7 183	8 317
Promenade	10 612	11 210	8 750	10 191
Maris Ledger	10 935	6 720	8 364	8 673
Merwester	9 277	8 528	8 327	8 711
		Hay (three cuts)		
Lemtal	10 494	8 838	4 478	7 937
Promenade	9 873	8 534	4 796	7 734
Maris Ledger	9 733	9 276	5 373	8 127
Merwester	8 665	9 867	5 891	8 141
		Pasture (four or five cuts)		
Lemtal	6 389	3 917	3 358	4 555
Promenade	5 996	4 669	3 568	4 744
Maris Ledger	7 602	5 006	3 362	5 323
Merwester	5 653	5 217	3 564	4 811

Table 29. Pasture yield of winter wheat, triticale, and fall rye at Lacombe in 1983, in kilograms per hectare

Crop	Days from seeding to cut			
	71	102	147	Total
Sundance winter wheat	1917	1096	432	3446
Winalta winter wheat	1541	1467	607	3616
Norstar winter wheat	1031	1023	324	2379
Kodiak fall rye	1684	828	380	2893
Puma fall rye	1260	1008	562	2832
Cougar fall rye	1277	1076	624	2978
Frontier fall rye	1246	940	505	2692
Wintri winter triticale	975	1054	571	2602

Table 30. Forage yield of brassica species at Lacombe in 1982 as dry matter, in kilograms per hectare

Cultivar	Silage yield*	Days to first cut	Pasture yield		
			Cut 1†	Cut 2*	Total
Maris Kestrel	6078	124	2801	372	3173
Merlin kale	6961	124	2288	258	2546
Bittern kale	6588	124	1739	33	1772
Condor kale	9008	124	2953	0	2953
Tema kale	7548	124	2610	91	2700
Angerro kale	6324	124	1047	275	1322
English Marrowstem kale	3296	124	902	72	974
Brassica napus IR-022	4976	81	4549†	450	4999
Brassica napus sinus	1526	81	308†	0	308
Nevin forage rape	6450	124	5032	454	5486
Appin grazing turnip	4217	124	3646	703	4349
Neris fodder radish	4803	81	4590†	489	5079
Rauola oilseed radish	6677	81	6484†	0	6484
Dwarf Essex forage rape	2770	124	1368	364	1732
English Broadleaf	6023	124	1458	0	1458
Candle canola	4609	81	5005†	0	5005
Altex canola	5207	81	5056†	206	5262

* Cut on 1 October.

† Cut on 29 July. Others in the same column cut on 10 September.

Table 31. Forage yield of brassica species at Lacombe in 1983 as dry matter, in kilograms per hectare

Cultivar	Silage yield			Pasture yield			
	Cut 1*	Cut 2	Total	Cut 1†	Cut 2	Cut 3	Total
Maris Kestrel	16 780	0	16 780	1 808	827	0	2 635
Merlin kale	16 698	0	16 698	1 214	1 189	0	2 403
Bittern kale	11 994	0	11 994	2 397	531	0	2 928
Condor kale	11 697	0	11 697	4 529	951	0	5 480
Tema kale	10 360	0	10 360	950	508	0	1 458
Nevin forage rape	14 044	0	14 044	2 788	741	1 272	4 801
Appin grazing turnip	15 244	0	15 244	2 436	1 747	813	4 996
Neris fodder radish	10 343*	5 965	16 308	2 343	1 247	1 513	5 103
Altex canola	9 523*	866	10 389	2 476	462	1 884	4 822
Apoll oil radish	13 964*	895	14 895	3 355	389	2 492	6 236
Crail fodder radish	15 916	0	15 916	2 154	1 137	953	4 244
Caron forage rape	16 630	0	16 630	2 585	674	711	3 970
Dinas forage rape	24 085	0	24 085	2 106	1 762	0	3 868
Tobin canola	11 385*	0	11 385	1 344	1 125	0	2 469
Gruner angiliter	9 205	0	9 205	654	1 020	0	1 674

* Cut on 29 July. Others in same column cut on 14 September.

† Cut on 4 July.